

## COLOR PROOF FORMING METHOD AND COLOR PROOF FORMING APPARATUS

### BACKGROUND OF THE INVENTION

The present invention relates to a color proof forming method and a color proof forming apparatus, and specifically to a method for forming the color poof by exposing the silver halide color light-sensitive material by a plurality of light sources having different wavelengths according to the dot image data processed by an RIP (Raster Image Processor), and to the color proof forming apparatus.

There is a case where, when a color printed matter is formed, the color correction is carried out on the stage of the document film, and a correction print (color proof) is formed by using the each color separation dot document film which is color-separated to a Y (yellow) image, M (magenta) image, C (cyan) image, and BK (black) image, and before an actual print film is formed, it is checked whether a layout

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However, recently, by the spread of DTP (Desk Top Publishing), or the like, an operation in which an image inputted by a scanner is image-edited and paginated by the software of a computer, comes into common use, and the edition by the full digital system also comes into common use.

In such the process, for the purpose of more efficiency, an image setter output to directly output the page-edited image data onto the film, a CTP (Computer to Plate) output to directly conduct the image recording on the print film, and further, or a CTC (Computer to Cylinder) to

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This DDCP forms a color proof to reproduce the output object shown by the digital image processed by the computer, and confirms its pattern, image tone, and the sentence and characters, before recording onto the print making film from the digital image data processed by the computer by the image setter, or the like, or conducting the final printing operation for directly forming the print film by the CTP, or directly recording the image onto the print film wound around the cylinder of the printing machine by the CTC.

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In this case, in the above-mentioned proof (1) and a part of the proof (2), there is a case that, for the needs of the reduction of the time limit of the delivery, and the cost reduction, the proofreading material by which the dot image can not be reproduced, that is, the proofreading by a sublimation transfer system, is conducted, or a case that the output matter such as the inkjet, or electrophotography is mainly used as the proof for the page-effect confirmation, however, for the confirmation of the reproducibility of a highlight portion or the confirmation of fine details, or the confirmation of the unsuitable interference fringes of the dot image, called moire, at the time of printing, the actual situation is that a proof by which the printing dot is faithfully reproduced, is strongly required.

For such the needs, recently, a DDCP in which, by using a high power heat mode laser, the image exposure is conducted on the sublimation transfer recording material or the heat sensitive recording material, and these are transferred onto the printing paper, begins to spread, however, in these systems, the cost of the laser head is high, the cost of the machine is high, and further, as the material, because a lot of color image forming sheets are used, the cost is high, and further, the process from the image exposure to transferring, is necessary for the number of colors, and a long period of time is required, which is a problem, and there is a problem that application for all businesses, and formation of many duplications as in the conventional printing proofreading, are difficult in the cost and the time.

Accordingly, as an apparatus to form such a color proof, an image recording apparatus, which has a drum provided with a plurality of holes penetrating from the outer peripheral surface to the inside, and a rotation driving mechanism to rotate the drum, and which exposes corresponding to the digital image signal, and records the dot image while rotating the drum by the rotation driving mechanism, under the condition that the light-sensitive material is being held on the drum, is proposed.

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However, when the printing is actually conducted, because an appearance is different in a portion of only the black image, and a portion in which the black image and the other color images are superimposed with each other (hereinafter, in this specification, called a "black overlap print"), it is perceived at first that the unnecessary other

color images are overlapped with the black image. That is, the miss in the image processing stage is perceived at first at the time of the printing, and a large uselessness is generated in the operation time or the each kind of material.

#### SUMMARY OF THE INVENTION

The present invention is attained to solve the above problems, and an object of the present invention is to realize a color proof forming method to form a color proof by which a portion of only the black image can be discriminated from a portion of the black overlap print, and a color proof forming apparatus.

Structures (1) to (5) to attain the above object are as follows.

(1) A color proof forming apparatus, which having: the structure in which a plurality of light sources with the different wavelengths are provided, and the light-sensitive material is exposed to the light beams emitted from the plurality of light sources; an image processor receiving a plurality of colors of image data including the black color, and forming the data for the exposure; a controller to control the plurality of light sources according to the data for the exposure formed by the image processor, wherein the

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image processor forms the data for the exposure which is different in the image data in which the black color and the other colors are overlapped with each other, and in the image data of only the black color.

(2) A color proof forming apparatus according to Structure (1), wherein the image processor forms the exposure data so that the higher density black color than in the case of the image data of only the black color is generated in the color light-sensitive material for the image data in which the black color and the other colors are overlapped with each other.

(3) A color proof forming apparatus according to Structure (1), wherein the image processor forms the exposure data so that the lower density black color than in the case of the image data of only the black color is generated in the color light-sensitive material for the image data in which the black color and the other colors are overlapped with each other.

(4) A color proof forming method, which having: a step which receives a plurality of colors of image data including the black color, and forms the image data for the exposure; and a step which exposes the color light-sensitive material according to the data for the exposure, and forms the color

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Further, preferred structures (6) to (9) are as follows.

(6) A color proof forming method to form a color proof by exposing the color light-sensitive material according to the plurality of colors of image data including the black color, which is characterized in that the color light-sensitive material is exposed in the condition which is different between the image data in which the black color and the other colors are overlapped with each other, and the image data of only the black color.

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(7) A color proof forming apparatus to form the color proof by exposing the color light-sensitive material by a plurality of light sources having the different wavelengths according to the image data, in which the color proof forming apparatus has: an image processor receiving the plurality of colors of image data, and generating the exposure data; and an exposure device to receive the exposure data from the image processor and to expose the color light-sensitive material, wherein the image processor forms the exposure data which is different between the image data in which the black color and the other colors are overlapped with each other, and the image data of only the black color.

In these inventions, the exposure data which is different between the image data in which the black color and the other colors are overlapped with each other, and the image data of only the black color, is formed and the exposure is conducted, and the color light-sensitive material is exposed in the different conditions.

Accordingly, the color proof by which a portion of only the black image can be discriminated from a portion of the black overlap print, can be formed. Incidentally, for the image data in which the black color and the other colors are overlapped with each other, when the exposure data is formed

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(8) A color proof forming apparatus according to Structure (7), wherein, for the image data in which the black color and the other colors are overlapped with each other, the image processor forms the exposure data so that the higher density black color than in the case of the image data of only the black color, is generated on the color light-sensitive material.

(9) A color proof forming apparatus according to Structure (7), wherein, for the image data in which the black color and the other colors are overlapped with each other, the image processor forms the exposure data so that the lower



Fig. 7 is a typical view showing a portion of the internal structure of the apparatus of an example of the embodiment of the present invention.

Fig. 8 is a block diagram showing the electric structure of the apparatus of an example of the embodiment of the present invention.

Fig. 9 is a characteristic view showing an example of the relationship between an exposure amount and the density of the light-sensitive material in the apparatus of an example of the embodiment of the present invention.

Fig. 10 is a view showing an example of the LUT in the conventional apparatus.

Fig. 11 is an illustration showing another example of the LUT of the embodiment of the present invention.

Fig. 12 is a characteristic view showing an example of the relationship between the exposure amount and the density of the light-sensitive material in the apparatus of an example of the embodiment of the present invention.

Fig. 13 is a flow chart showing an operation of the apparatus of an example of the embodiment of the present invention.

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Fig. 14 is a flow chart showing an operation of the apparatus of an example of the embodiment of the present invention.

Fig. 15 is a flow chart showing an operation of the apparatus of an example of the embodiment of the present invention.

Fig. 16 is a flow chart showing an operation of the apparatus of an example of the embodiment of the present invention.

Fig. 17 is a flow chart showing an operation of the apparatus of an example of the embodiment of the present invention.

Fig. 18 is a flow chart showing an operation of the apparatus of an example of the embodiment of the present invention.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to the drawings, an embodiment of the present invention will be described below. Incidentally, the present invention is not limited to the embodiment, which will be described below. Further, there is a description in which the meaning of terms are described, however, this is the description which describes the meaning of terms strictly in

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(Structure)

Initially, the overall structure of an image recording

The image recording apparatus of the present embodiment

Further, in the image recording apparatus of the

material is set, and in the exposure section, after it is cut into the sheet-like material, it is exposed corresponding to the digital image signal, and then, it is development-processed in a development processing section, and the color proof is formed.

In Fig. 2 to Fig. 4, the color proof forming apparatus is shown. Fig. 2 is a perspective view of the color proof forming apparatus, Fig. 3 is a perspective view of the color proof forming apparatus in the condition in which a feed cover is opened, and Fig. 4 is a typical view of the internal structure of the color proof forming apparatus.

In an apparatus main body 2 of the color proof forming apparatus 1, an exposure unit 3 and a development processing unit 4 are provided. In the exposure unit 3, an upper surface panel 5, and a front surface panel 6 are provided so that these can be opened and closed, and the maintenance operation can be conducted from the upper surface and front surface side. On the upper portion of the exposure unit 3, a sheet loading section 7 is located on the development section side, and an operation section 8 is located on the front surface side of the apparatus main body 2 on the front side of the sheet loading section 7. In the sheet loading section 7, a feed cover 9 is provided so that it can be opened and



closed, and a cartridge 10 in which the light-sensitive material (hereinafter, called paper or light-sensitive material) is accommodated, can be set by the feed cover 9. A liquid crystal panel 11 and a touch panel 12 are provided in the operation section 8.

An upper surface panel 13 and a replenishment panel 14 are provided to the development processing unit 4 so that these panels can be opened and closed, and the maintenance operation is carried out from the upper surface side, and the replenishment of a processing solution is carried out from the front surface side. A sheet delivery section 15 is provided on the side portion of the development processing unit 4, and the processed light-sensitive material is delivered to the sheet delivery section 15.

Fig. 4 is a view showing a schematic structure of the color proof forming apparatus. In the exposure unit 3, a sheet feed section 20, a primary scanning section 30, a sub-scanning section 40, a sheet delivery section 50, and an accumulator section 60 are provided. In the sheet feed section 20, feed rollers 21a, 21b, a cutter 22, and a drum feed roller 23 are provided. The light-sensitive material is pulled from the cartridge 10 by the feed rollers 21a and 21b, cut into a predetermined length by the cutter 22, and fed to

the primary scanning section 30 through the drum feed roller 23.

A drum 31 is rotatably provided in the primary scanning section 30, and the light-sensitive material is attracted to the outer surface of the drum 31, and integrally rotated. An optical unit 32 is arranged opposite to the drum 31, and the optical unit 32 can move in parallel with the drum axis by the sub-scanning section 40. The optical unit 32 receives the digital image signal and exposes the light-sensitive material attracted onto drum 31 by an LED light emitting beam, and writes the image onto the light-sensitive material.

The sheet delivery section 50 is provided with a separation guide 51, and the light-sensitive material onto which writing is completed, is separated from the drum 31 by the separation guide 51 and sent to the development processing unit 4. At this time, when the conveyance speed of the development processing unit 4 is slower than the sheet delivery speed of the exposure unit 3, the light-sensitive material is sent to the accumulator section 60 while the sheet delivery speed is high, and the light-sensitive material is accumulated so that it hangs down on the accumulator section 60, and is in timed relationship with the conveyance timing of the development processing unit 4, so

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that the processing capacity of the exposure unit 3 is not lowered.

The development processing unit 4 is provided with the second exposure section 41 (hereinafter, an example of the reversal exposure direct positive light-sensitive material will be described), the development section 42, fixing section 43, stabilization section 44, and drying section 45. A portion of the light-sensitive material which is not exposed by the exposure unit 3 forms a false-image by the second exposure section 41, and the light-sensitive material which is second-exposed, is conveyed to the development section 42, fixing section 43 and stabilization section 44, and development processed, and the processed light-sensitive material is dried by the drying section 45, and sent to the sheet delivery section 15.

Next, the structure of each section of the color proof forming apparatus will be detailed by using Fig. 5 to Fig. 7. Fig. 5 is a side view showing a paper loading section and a paper feed section, Fig. 6 is a plan view showing the primary scanning section and the sub-scanning section, and Fig. 7 is a side view showing a sheet delivery section and an accumulator section.



A paper end sensor S4 is provided in the feed section 20 between the feed rollers 21a, 21b and the cartridge 10, and the trailing edge of the light-sensitive material pulled from the cartridge 10 is detected by the paper end sensor S4. A position of one feed roller 21a is fixed, and the other feed roller 21b can be moved by a roller movement mechanism 24, and the feed roller 21b is moved to a stand-by position for preventing the paper wrinkle from being generated due to the pressure-contact of the roller, except for the time

period during the paper conveyance operation. The roller movement mechanism 24 is operated by a feed roller pressure release motor M2.

During the conveyance of the light-sensitive material, the feed roller 21b is moved to the conveyance position, and the light-sensitive material is pressure-contacted between the feed rollers 21a and 21b which are opposite to each other. The position of the feed roller 21b is detected by a feed roller pressure-contact position detecting sensor S5 and a feed roller release position detecting sensor S6. The feed roller 21a is operated by the feed motor M3.

The cutter 22 is operated by a cutter motor M20. An encoder roller 25 and a guide 26 are provided between the cutter 22 and a drum feed roller 23. The encoder roller 25 sends the light-sensitive material by the rotation, and detects the feed amount of the light-sensitive material.

The drum feed roller 23 can be moved to the contact pressure position and the release position by the roller movement mechanism 27. This drum feed roller 23 is driven by the drum feed motor M4. The position of the drum feed roller 23 is detected by the drum feed roller pressure position detecting sensor S7 and the drum feed roller release position detecting sensor S8, which are not shown in the drawing. The

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roller movement mechanism 27 is operated by the drum feed roller pressure release motor M5.

Shaft portions 31a and 31b of both ends of the drum 31 of the primary scanning section 30 are pivotally supported rotatably by support bases 34a and 34b through bearings 33a and 33b. A drive pulley 35a is provided on one shaft portion 31a of the drum 31, and the drive pulley 35a is connected to an output pulley 35b of a drum rotation motor M6 with a belt 36, and the drum 31 is rotated by the drive of the drum rotation motor M6. Further, on one shaft portion 31a of the drum 31, a rotary encoder 37 is provided, and the rotary encoder 37 outputs a rotation pulse, and is used for the pixel clock control which is in timed relationship with the drum rotation.

The other shaft portion 31b of the drum 31 is connected to a suction blower P1. The drum 31 is formed of a hollow body, and suction holes 31c are formed on the drum surface, and the inside of the drum 31 is pressure-reduced by the drive of the suction blower P1 and the light-sensitive material is attracted onto the surface of the drum 31.

A red LED unit 320, green LED unit 321, and blue LED unit 322 are arranged in the optical unit 32. The light beam from the red LED unit 320 and green LED unit 321 exposes

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In the drum axis direction of the optical unit 32, a sub-scanning reference position detecting sensor S11, a sub-scanning writing position detecting sensor S12, and a sub-scanning over run position detecting sensor S13 are arranged. The optical unit 32 is stopped by the sub-scanning reference position detection of the sub-scanning reference position detecting sensor S11, and the sub-scanning is started from this sub-scanning reference position, and the sub-scanning is stopped by the movement amount corresponding to the image

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The exit shutter 55 is opened and closed by an exit shutter motor M10. The open and close of the exit shutter 55 is detected by an exit shutter open detecting sensor S16. The exit shutter 55 determines the delivery timing of the light-sensitive material, and opens the exit shutter 55 at the predetermined timing, and sends the light-sensitive material to the development processing unit 4. Further, an



exit sensor S31 to detect that the light-sensitive material is sent to the development processing unit 4, is provided.

The accumulator section 60 is arranged at the lower position of the sheet delivery section 50, and when the separation guide 51 is moved downward, the light-sensitive material hangs down in the accumulator section 60. According to this, when the light-sensitive material is accumulated at the high speed (to the development conveyance speed), the light-sensitive material can be sent to the development processing unit 4 without being damaged.

In Fig. 8, the electrical structure of the present apparatus will be shown as a block diagram. As shown in this Fig. 8, the control section 100 has a CPU 101, RAM 102, and ROM 103, and is connected to each sensor and a group of actuators through I/O ports 104 and 105, and controls the group of actuators according to the information from each sensor.

As sensors, the cartridge presence sensor S1, closing cover sensor S2, cover lock detecting sensor S3, paper end sensor S4, feed roller pressure position detecting sensor S5, feed roller release position detecting sensor S6, drum feed roller pressure position detecting sensor S7, drum feed roller release position detecting sensor S8, paper leading

edge reference position sensor S9, paper feeding amount detecting sensor S10, rotary encoder 37, sub-scanning reference position detecting sensor S11, sub-scanning writing position detecting sensor S12, sub-scanning over-run position detecting sensor S13, separation guide opening sensor S14, separation guide closing sensor S15, exit shutter opening detecting sensor S16, and separation jam detecting sensor S30 are connected. Further, the exit sensor S31 which is not shown in this drawing, is also connected.

As the group of actuators, a cover lock motor M1, feed roller pressure releasing motor M2, feed motor M3, cutter motor M20, drum feed motor M4, drum feed roller pressure release motor M5, drum rotation motor M6, sub-scanning motor M7, exposure shutter solenoid 333, conveyance motor M8, separation guide up-down motor M9, and exit shutter motor M10 are connected, and respectively driven through drivers D1, D2, D3, D11, D5, D4, D6, D7, D333, D8, D9, and D10.

Further, in the operation section 8, a liquid crystal panel 11 is controlled by a driver D20, and displays the operation condition of the color proof forming apparatus. Further, a command by the operation from a touch panel 12 is sent to the CPU 101 as the digital information by an A/D converter 120.

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emission intensity of R, G, B specified by the LUT 205, and the exposure is conducted in a pixel unit in which the LED light emission of 3 wavelengths are overlapped.

Herein, the LUT 205 is characterized in that it forms the exposure data different in the image data in which the black color and other colors are overlapped with each other, and in the image data of only the black color. That is, in the present embodiment, the exposure data different in the image data in which the black color and other colors are overlapped with each other, and in the image data of only the black color, is formed and the exposure is conducted, and the light-sensitive material is exposed in the different conditions. According to this, a color proof by which a portion of only the black color, and a portion of the black overlap print can be discriminated, can be formed.

Fig. 1 shows the content of the table of the printing data and the light emission intensity of the LED unit when the direct positive light-sensitive material is used. Incidentally, the relationship between the light emission amount of the LED unit and the density of the light-sensitive material obtained by the exposure, is defined as shown in Fig. 9.

**Figure 1**

In contrast to that, in the present embodiment, not only 0 % and 100 % of the light emission amount in Fig. 9, but also 5 % and 10 % are used. When BK is reproduced, each LED unit respectively emits the light by 5 %, and the density of D5 which is slightly thinner than the conventional Dmax,

is obtained for each color. Further, for other colors which are overlapped with the BK, 5 % light emission, not the conventional 0 %, is conducted so that the weight becomes clear (Fig. 1 (1)). Incidentally, in this case, when all of Y, M, and C are overlapped with the BK, the light emission amount is made to 0 %, and the maximum density is obtained.

Further, at the same time as the density is lowered as described above, the reproduction of the color not including the BK, is conducted so that each LED unit respectively emits the light by 10 %, which is not the conventional 0 % for each color, and the density of D10 which is slightly thinner than conventional Dmax, is obtained for each color (Fig. 1 (2)).

When the exposure data is formed from the image data by using the above-described LUT 205, for the image data in which the BK is overlapped with other colors (Y, M, C, R, G, B, GY), the higher density black color than in the case of the image data of only the BK, can be generated on the color light-sensitive material. Further, it can also be discriminated with which color the BK is overlapped.

Fig. 11 shows the table content of the print data and the light emission intensity of the LED unit, when the negative light-sensitive material is used. Incidentally, the

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In contrast to that, in the present embodiment, not only 0 % and 100 % of the light emission amount in Fig. 12, but also 90 % and 95 % are used. When BK is reproduced, each LED unit respectively emits the light by 95 %, and the density of D95 which is slightly lighter than the conventional Dmax, is obtained for each color. Further, for other colors which are overlapped with the BK, 100 % light emission is conducted so that the weight becomes clear (Fig. 11 (1)). Incidentally, in this case, when all of Y, M, and C

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Incidentally, in the above description, when the light emission intensity is controlled to 5 %, 10 %, 90 %, 95 %, except for 0 % and 100 %, the exposure is conducted so that the weight of other colors to the BK color can be known, however, the numeric values to regulate the light emission intensity are not limited to the values shown here. Further, corresponding to the color of the ink, the values of 0 %, 5



[illegible]

Incidentally, in the case where the positive light-sensitive material using the panchromatic emulsion is used, when the BK color is overlapped with other colors, by setting the light emission amount which is conventionally 0 %, to 5 %, the photosensitive layer of the panchromatic emulsion does not react, but the photosensitive light of the color corresponding to the exposure reacts to it, and the density is lowered. According also to this, the weight of the BK color and other colors can be distinctly shown.

(Operation)

Herein, operations of an image recording apparatus to which the embodiment of the present invention is applied, will be described.

Referring to Fig. 13 to Fig. 18, operations of the color proof forming apparatus will be described below. Fig. 13 is a main flow chart of the operations of the color proof forming apparatus, Fig. 14 and Fig. 15 are flow charts of the sheet feed processing of the color proof forming apparatus, Fig. 16 is a flow chart of the print processing of the color proof forming apparatus, Fig. 17 is a flow chart of the sheet delivery processing of the color proof forming apparatus, and Fig. 18 is a flow chart of the delivery processing of the color proof forming apparatus.

Initially, a main operation of the color proof forming apparatus will be described. In a main flow chart of the operation of the color proof forming apparatus in Fig. 13, when the main switch is turned ON in step a1, the initial setting of the apparatus is conducted in step b1, further, the initial setting of each mechanism portion is conducted in step c1, and when an error occurs herein, the function stops.

When the initial setting is completed, an idling operation is conducted, and a remote processing can be conducted (step d1). The condition setting can be conducted

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by the operation of the menu key of the touch panel 12 of the operation section 8 during this idling operation (step e1), and when this condition setting is conducted, the local processing can be conducted. When the condition setting is not conducted by the operation of the menu key of the touch panel 12, the remote processing by which the output image from the RIP is received and the print of the received image data is conducted, is carried out.

Further, when the light-sensitive material becomes insufficient and replenishment is conducted during the idling operation, the sheet feed cover 9 is opened, the cartridge 10 is set, the sheet feed cover 9 is closed, and the sheet feed processing to cut a fogged portion of the leading edge of the light-sensitive material is conducted, and the operation returns to the idling operation (step f1), however, when an error occurs in the sheet feed processing to cut the fogged portion of the leading edge of the light-sensitive material, the function is stopped.

The writing operation consists of the sheet feeding (step g1), printing (step h1), and sheet delivery (step i1), and when this writing processing is completed, the next light-sensitive material can be fed (step j1).

Next, the sheet feed processing of the color proof forming apparatus will be described. In the flow chart of the sheet feed processing of the color proof forming apparatus in Fig. 14, the judgment of the existence of the cartridge 10 is conducted in step a2, and when the cartridge 10 does not exist, the error processing is conducted (step b2).

When the cartridge 10 exists, the trailing edge of the light-sensitive material is detected according to the detection signal from the paper end sensor S4 (step c2), and when the trailing edge of the light-sensitive material is detected, the error processing is conducted (step b2).

When the trailing edge of the light-sensitive material is not detected, the sheet feed cover 9 is locked (step d2), the feed roller 21b is brought into pressure-contact (step e2), and further, the drum feed roller 27 is brought into pressure-contact (step f2). Then, the excitation of the drum rotation motor M6 is turned OFF, and the drum 31 is made to be rotatable (step g2), the feed motor M3 is rotated, and the light-sensitive material is fed by the feed rollers 21a and 21b (step h2).

The leading edge portion of the light-sensitive material is detected by the paper leading edge reference

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2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564 2565 2566 2567 2568 2569 2570 2571 2572 2573 2574 2575 2576 2577 2578 2579 2580 2581 2582 2583 2584 2585 2586 2587 2588 2589 2590 2591 2592 2593 2594 2595 2596 2597 2598 2599 2600 2601 2602 2603 2604 2605 2606 2607 2608 2609 2610 2611 2612 2613 2614 2615 2616 2617 2618 2619 2620 2621 2622 2623 2624 2625 2626 2627 2628 2629 2630 2631 2632 2633 2634 2635 2636 2637 2638 2639 2640 2641 2642 2643 2644 2645 2646 2647 2648 2649 2650 2651 2652 2653 2654 2655 2656 2657 2658 2659 2660 2661 2662 2663 2664 2665 2666 2667 2668 2669 2670 2671 2672 2673 2674 2675 2676 2677 2678 2679 2680 2681 2682 2683 2684 2685 2686 2687 2688 2689 2690 2691 2692 2693 2694 2695 2696 2697 2698 2699 2700 2701 2702 2703 2704 2705 2706 2707 2708 2709 2710 2711 2712 2713 2714 2715 2716 2717 2718 2719 2720 2721 2722 2723 2724 2725 2726 2727 2728 2729 2730 2731 2732 2733 2734 2735 2736 2737 2738 2739 2740 2741 2742 2743 2744 2745 2746 2747 2748 2749 2750 2751 2752 2753 2754 2755 2756 2757 2758 2759 2760 2761 2762 2763 2764 2765 2766 2767 2768 2769 2770 2771 2772 2773 2774 2775 2776 2777 2778 2779 2780 2781 2782 2783 2784 2785 2786 2787 2788 2789 2790 2791 2792 2793 2794 2795 2796 2797 2798 2799 2800 2801 2802 2803 2804 2805 2806 2807 2808 2809 2810 2811 2812 2813 2814 2815 2816 2817 2

In the flow chart of the sheet feed processing of the color proof forming apparatus in Fig. 15, the paper suction blower P1 is turned ON in step a3, and its stabilization is waited (step b3), and after the stabilization, the drum feed motor M4 is turned ON (step c3). Thereby, the paper is wound around the drum 31 while being sucked to it.

The paper length measurement is started in step d3, and after a predetermined length is pulled out (step e3), the drum feed motor M4 is turned OFF in step f3. The feed roller 21b is brought into pressure-contact in step g3, and the

paper cut is conducted in step h3, the drum feed motor M4 is turned ON in step i3, and the pressure-contact of the feed rollers 21a and 21b is released in step j3.

After the waiting of the completion of the paper winding around the drum in step k3, the drum feed motor M4 is turned OFF in step l3, and the pressure-contact of the drum feed and delivery roller 23 is released in step m3.

In the flow chart of the print processing of the color proof forming apparatus in Fig. 16, the drum rotation motor M6 is turned ON in step a4, and the stabilization of the rotation of the drum 31 is waited (step b4), the sub-scanning motor M7 is turned ON (step c4), the exposure shutter 332 is turned ON (step d4), and the optical unit 32 is moved in the direction of the drum axis and sub-scanning is conducted, and the sub-scanning writing position is detected in step e4, and the image data is outputted (step f4).

At this time, the red LED unit 320, green LED unit 321, and blue LED unit 322 respectively emit the light according to the LUT data of the set channel, and expose the image having the color corresponding to the color of the ink at the time of the print and/or the color of the print sheet.

Incidentally, in this case, for the image data in which the BK color and other colors (Y, M, C, R, G, B, GY) are

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overlapped with each other, the exposure data is made so that the higher density or lower density black color than in the case of the image data of only the BK color is generated on the color light-sensitive material.

When the writing of the image data is completed in step g4, the drum rotation motor M6 is turned OFF (step h4), the sub-scanning motor M7 is turned OFF (step i4), and optical unit 32 is moved to the home position (step j4).

Then, the drum feed roller 23 is brought into pressure-contact with the drum 31 in step k4, the excitation of the drum rotation motor M6 is turned OFF (step l4), and the drum 31 is moved to the home position by the rotation of the drum feed roller 23 (step m4).

In the flow chart of the sheet delivery processing of the color proof forming apparatus in Fig. 17, the separation guide 51 is closed and set to the separation position in step a5, and the exit shutter 55 to the development processing unit 4 is opened (step b5), and it is brought into pressure-contact with the drum feed roller 23 (step c5).

The drum feed motor M4 is turned ON in step d5 and the drum feed roller 23 is rotated, and the conveyance motor M8 is turned ON, and the light-sensitive material is conveyed at high speed and fed (step e5). By the separation jam

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In the flow chart of the sheet delivery processing of the color proof forming apparatus in Fig. 18, the delivery of the light-sensitive material is detected by the exit sensor S31 in step a6, and when the trailing edge of the light-sensitive material is detected, the completion of the delivery of the light-sensitive material is waited for a predetermined period of time (step b6), and the conveyance



motor M8 is turned OFF (step c6), and the exit shutter 55 to the development processing unit 4 is closed (step d6), and the lock of the feed cover 9 is released, and the delivery processing of the light-sensitive material is completed (step e6).

An example in which the LED units are used as the R light source, G light source, and B light source, is described above, however, each R, G, B light source is not limited to that, but all of the R, G, B light sources may be structured by using the LDs (laser diode), and further, it is of course that each of R, G, B light sources may be structured by using the AOM and LD.

As detailed above, when the exposure data which is different in the image data in which the black color and other colors are overlapped with each other, and in the image data of only the black color, is made, and the exposure is conducted, and the color light-sensitive material is exposed in the different conditions, the color proof by which a portion of only the black color can be discriminated from a portion of the black overlap print, can be formed.

As described above, the performance and the reliability as the DDCP are increased, and the check of the black overlap print can be conducted in the stage before printing.